

Certificate Course in Solid Waste Management Examination, August 2009
Course – I : Block – I : SOLID WASTE : COMPOSITION AND COLLECTION

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** the questions :

(1×40=40)

I. Choose the correct answer :

- 1) The wastes generated in hotels are called
 - a) Residential
 - b) Commercial
 - c) Industrial
 - d) Institutional
- 2) Glass is the example of _____ material.
 - a) Combustible
 - b) Non-combustible
 - c) Farm waste
 - d) Biodegradable
- 3) The density of solid waste ranges from _____
 - a) 150 kg/m^3 to 600 kg/m^3
 - b) 600 kg/m^3 to 800 kg/m^3
 - c) 0 kg/m^3 to 100 kg/m^3
 - d) 800 kg/m^3 to 1000 kg/m^3
- 4) The per capita waste generation rate is about _____ g/day in India.
 - a) 500
 - b) 800
 - c) 1000
 - d) 1200
- 5) Garbage in Indian cities contain about _____ % biodegradable waste.
 - a) 20
 - b) 40
 - c) 60
 - d) 80

P.T.O.

- 6) The highest organic content in solid waste is found in _____
- a) Bangalore
 - b) Delhi
 - c) Kolkatta
 - d) Chennai
- 7) The potential for power generation from urban municipal waste estimated to generate upto _____ MW of electricity.
- a) 4000
 - b) 3000
 - c) 2000
 - d) 1000
- 8) The moisture content of typical food waste is _____
- a) 30%
 - b) 50%
 - c) 70%
 - d) 90%
- 9) Moisture content is the ratio of the weight of water to the total weight of _____
- a) Dry waste
 - b) Wet waste
 - c) Zero waste
 - d) None of these
- 10) Plastics are _____
- a) natural fibres
 - b) proteins
 - c) natural lipids
 - d) synthetic organic materials
- 11) Heating value (kj/kg) of typical plastics is _____
- a) 4500
 - b) 16500
 - c) 18500
 - d) 32500
- 12) Inert residue of typical wood is _____
- a) 1.5
 - b) 2.5
 - c) 3.5
 - d) 4.5

- 13) Dengue fever is transmitted by _____
- a) rodents
 - b) bacteria
 - c) mosquitoes
 - d) bedbugs
- 14) Landfill gas contain _____
- a) ethane
 - b) methane
 - c) hydrogen
 - d) argon
- 15) In Bangalore the major composition (in %) of solid waste is _____
- a) textiles
 - b) dust and ash
 - c) paper and plastics
 - d) putrecible
- 16) The specially designed device for burning solid waste is called _____
- a) digester
 - b) incinerator
 - c) container
 - d) aerator
- 17) Communal container which is movable is called _____
- a) stationary
 - b) hauled
 - c) curbside
 - d) none
- 18) The problems of cockroaches are associated with the _____ storage of solid waste.
- a) poor
 - b) rich
 - c) moderate
 - d) none of these
- 19) Typical ferrous metals show inert residue value of _____
- a) 70
 - b) 78
 - c) 88
 - d) 98

- 20) Portion of the waste that is converted to gases before and during combustion is called _____
- a) organic matter
 - b) volatile matter
 - c) synthetic matter
 - d) degradable matter
- 21) Moisture content in typical rubber is _____
- a) 2%
 - b) 6%
 - c) 8%
 - d) 10%
- 22) WSA stands for _____
- a) Waste Solid Assessment
 - b) Wet Solid Assessment
 - c) World Solid Assessment
 - d) Waste Stream Assessment
- 23) The pneumonic plague that broke out in November 1994 in India is the typical example of _____ waste mismanagement.
- a) liquid
 - b) solid
 - c) gaseous
 - d) synthetic
- 24) Ash and Dust form the major composition of Urban Solid Waste in _____
- a) Delhi
 - b) Bangalore
 - c) Mumbai
 - d) Kolkata
- 25) Litter is the example of _____ waste.
- a) agricultural
 - b) municipal
 - c) residential
 - d) industrial
- 26) The rate of biodegradation of lipids is _____
- a) slow
 - b) rapid
 - c) very high
 - d) moderate

- 27) Poly Vinyl Chloride (PVC) when burnt produces _____
- a) dioxin and oxygen
 - b) dioxin and methane
 - c) methane and acid gas
 - d) dioxin and acid gas
- 28) The unpleasant odour in garden waste is due to the production of _____
- a) alkenes
 - b) methane
 - c) amines
 - d) none of these
- 29) Washing machine and refrigerators form _____ waste.
- a) street
 - b) bulky
 - c) form
 - d) demolition
- 30) The primary step in solid waste management is _____
- a) storage
 - b) transport
 - c) composting
 - d) disposal
- 31) High temperature and humidity _____ solid waste decomposition
- a) increases
 - b) decreases
 - c) neutralizes
 - d) bring no change in
- 32) The percentage of organic matter has remained almost static at _____ in the past three decades.
- a) 11%
 - b) 21%
 - c) 31%
 - d) 41%
- 33) Waste Disposal is the _____ stage of the waste management cycle.
- a) primary
 - b) intermediate
 - c) final
 - d) initial

- 34) The highest metal contents in Urban Solid Waste is seen in _____
- a) Ahmedabad
 - b) Bangalore
 - c) Chennai
 - d) Delhi
- 35) Land dumping is a method of waste _____
- a) accumulation
 - b) burning
 - c) collection
 - d) disposal
- 36) The heating value is determined experimentally using _____
- a) thermometer
 - b) spectrophotometer
 - c) nephelometer
 - d) bomb calorimeter
- 37) During combustion, the temperature of the combustion gases reaches _____
- a) above 100° C
 - b) below 100° C
 - c) 100° C
 - d) none
- 38) The moisture content in the waste _____ the dry organic material per kg of waste.
- a) increases
 - b) reduces
 - c) maintains
 - d) none
- 39) Proximate analysis is done to evaluate the _____ properties of the waste.
- a) fermentation
 - b) storage
 - c) combustion
 - d) disinfection
- 40) Pigs are involved in the spread of disease
- a) leptospirosis
 - b) filaria
 - c) cholera
 - d) toxoplasmosis

SECTION – B

II. Answer **any eight** of the following : **(8×5=40)**

- 1) Give an account of source based classification of Solid Wastes with examples.
 - 2) Explain the factors affecting Solid Waste Management System.
 - 3) Describe rationale for analysis of waste.
 - 4) Point out the chemical characteristics of solid waste.
 - 5) Discuss the environmental effects due to improper waste management.
 - 6) Explain the collection components of waste.
 - 7) Describe micro-routing.
 - 8) Describe the functional elements in typical Solid Waste Management.
 - 9) Discuss the Health Impacts due to Solid Waste generation.
 - 10) Tabulate the composition of Solid Waste in Bangalore.
 - 11) Describe communal containers.
 - 12) Explain motion time measurement technique.
-

Certificate Course in Solid Waste Management Examination, August 2009
Course – I : Block – II : SOLID WASTE DISPOSAL AND PROCESSING

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** the questions :

(40×1=40)

1. The capacity of solid waste medium transfer station is ranging between
 - a) 100 to 500 t/day
 - b) 1000 to 5000 t/day
 - c) 5 to 50 t/day
 - d) 10 to 100 t/day
2. If the transfer vehicles are weighed during loading, trailers can be more consistently loaded to just under
 - a) actual weight
 - b) local weights
 - c) maximum legal weights
 - d) deformed weight
3. The construction cost of platform / pit non-compaction stations are usually higher because of
 - a) Material are not available
 - b) Cement and steel cost is high
 - c) Labour cost is too high
 - d) Increased floor space
4. Pit stations has been designed based on
 - a) Depth of pit
 - b) Soil condition
 - c) Rate at which wastes can be unloaded from collection vehicles
 - d) None of the above
5. The cost of using the large vehicle for MSW dumping is the sum of
 - a) transportation cost and loading cost
 - b) appreciation cost and unloading charges
 - c) loading and unloading cost
 - d) the vehicle depreciation, fuel cost and salary to driver

P.T.O.

12. During the process of collection and transport of MSW, each collection crew should complete daily report containing
- Total quantity, and distance hauled, amount delivered at each disposal
 - Number of workers/day
 - Amount of fuel used per day
 - All the above
13. At present in Bangalore there are about
- 140 bottomless cement bins
 - 1400 _____ „ _____
 - 14,000 _____ „ _____
 - 1,40,000 _____ „ _____
14. SWM is more than a technical issue, as any successful programme needs
- Social support
 - Financial support
 - Political and government support
 - None of the above
15. In uncontrolled dumping method, wastes are dumped at a designated site
- With environmental control
 - Without environmental control
 - With proper living facilities
 - None of the above
16. Small scale composting practices can be effective at house-hold level, but this needs public awareness
- True
 - False
17. Composting is
- a physical process
 - an adsorption process
 - ion exchange process
 - biological process
18. Pyrolysis a process of thermal degradation which occurs at temperatures ranging between
- 20°C and 90°C
 - 2000°C and 9000°C
 - 200°C and 900°C
 - 2°C and 20°C

19. If land filling is done properly executed, then it is safer and cheaper than
- a) Incineration
 - b) Windrose method
 - c) Combustion
 - d) None of the above
20. The various phases in the life cycle of a land fill include
- a) planning, construction, operation and storage phase
 - b) solid, liquid and gaseous phase
 - c) lag, log, stationary and decline phase
 - d) aerobic and anaerobic phase
21. Methanogenic bacteria in the sanitary land fill will produce
- a) Carbon monoxide gas
 - b) Sulfur dioxide gas
 - c) Oxygen
 - d) Methane gas
22. In the sanitary land fill the flamability of methane depends on
- a) percentage of hydrogen present
 - b) percentage of oxygen present
 - c) percentage of moisture content
 - d) percentage of humidity
23. In the land fill gas methane is flammable in air within the range of 5 to 15% by volume, while hydrogen is flammable within the range between
- a) 0.1 to 1.0% by volume
 - b) 10 to 20% by volume
 - c) 4 to 7.5% by volume
 - d) 20 to 60% by volume
24. The proportion of void space in ground, rather than permeability, determines the variability of gas emission.
- a) True
 - b) False
25. In the Leachate migration from the sanitary land fill, the natural as well as geo-membrane liners are often provided combinedly to enhance
- a) Leachate amount
 - b) Percolation rate
 - c) Overall efficiency of contaminant system
 - d) All the above

26. The main factors which govern the leachate migration in the sanitary land fill are
- Temperature of the solid waste
 - Water content in the solid wastes
 - Amount of solid wastes
 - The surrounding geology and hydrogeology
27. Leachate from the land filled waste can be readily degraded by biological means, due to
- high BOD content
 - high COD content
 - high volatile fatty acid content
 - high iron content
28. Surface runoff, which has been in contact with the land filled wastes, may be a problem in
- the plain area
 - hilly area
 - valley region
 - the area of intense rainfall
29. Once a potential site for sanitary land fill has been identified/selected an assessment of design aspects, including costs for civil work, begins
- True
 - False
30. Land fill capping is required to control and minimise the
- Leachate generation
 - Temperature variations
 - Water content variations
 - The pH variation
31. In cell method of land filling, the processes include
- the deposition of wastes with-in pre-constructed bounded area
 - excavation of trenches
 - waste deposition in layers
 - placement of suitable wastes against lined canyon
32. Some of the principal problems associated with disposal of solid wastes can be categorized as
- Diseases
 - Air/noise pollution
 - Ground and surface water pollution
 - All the above

33. Mechanical volume and size reduction is to increase the volume and size of the wastes, as compared to its original form.
- a) True
 - b) False
34. Hammer mill is used to
- a) increase the size of solid wastes
 - b) reduce the size of the wastes
 - c) increase the moisture content of the wastes
 - d) reduce the density of wastes
35. In addition to chemical volume reduction by incineration, the other methods of reduction of volume by chemically are
- a) Pyrolysis and hydrolysis
 - b) Dialysis and osmosis
 - c) Photolysis and dialysis
 - d) None of the above
36. Zig-zag air classifier is used to
- a) compact the wastes
 - b) densify the wastes
 - c) aerate the wastes
 - d) segregate the various components present in the solid wastes
37. Rotating wire screens in MSW management has been used to segregate
- a) Metal content
 - b) Grit particles
 - c) Plastics
 - d) Cardboard and paper products
38. Recirculation of leachate is required in a municipal sanitary land fill sites during
- a) Winter season
 - b) Spring season
 - c) Summer season
 - d) Rainy season
39. In conduction method of MSW drying
- a) hot air is in direct contact with wet solid waste stream
 - b) the heat is transmitted directly to the wet solid stream by radiation
 - c) wet solid waste stream is in contact with a heated surface
 - d) none of the above
40. In refuge placement method of land filling each progressive layer should not be more than
- a) 1.0 m
 - b) 0.1 m
 - c) 10 m
 - d) 0.3 m

SECTION – B

Answer **any eight** full questions :

(8×5=40)

1. Bring out the importance of the need of MSW management in urban towns and cities.
 2. What are the MSW transfer stations? Mention the types of transfer stations and discuss any one of them.
 3. How do you design the capacity of the transfer station?
 4. Briefly discuss about the record keeping, control and monitoring in the solid waste management.
 5. What are the major issues to be discussed in the solid waste disposal? Discuss.
 6. Explain the selection criteria for the waste disposal in the major towns and cities.
 7. Discuss briefly the sanitary land fill processes.
 8. What are the major environmental effects of land fill on various aspects? Discuss.
 9. What are the various land filling techniques available with us? Explain any two of them.
 10. Explain the low and high pressure compaction method used in the volume and size reduction of MSW.
 11. With a sketch explain the hammer mill used in the size reduction of Municipal solid wastes.
 12. Draw the sketch of “Suspended type permanent magnet separator”, used in the separation of ferrous scrap from the MSW and explain briefly.
-

Certificate Course in Solid Waste Management Examination, August 2009
Course – II-Block – I : SOLID WASTE : RECYCLING AND RECOVERY

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** questions.

(1×40=40)

I. Choose the correct answer.

- 1) Balers are used to density _____
 - a) aluminium
 - b) copper
 - c) iron
 - d) paper
- 2) In plastic processing the material is electrically heated at _____
 - a) 159° C
 - b) 259° C
 - c) 359° C
 - d) 459° C
- 3) Metals account for _____ of the solid waste generated.
 - a) 2%
 - b) 12%
 - c) 20%
 - d) 6%
- 4) The major gas in biogas is _____
 - a) oxygen
 - b) H₂S
 - c) CO₂
 - d) methane
- 5) Source reduction is also known as _____
 - a) waste collection
 - b) waste prevention
 - c) waste generation
 - d) waste disposal

P.T.O.

- 6) The lighter emission of incineration are called _____
- | | |
|----------|---------------|
| a) plume | b) bottom ash |
| c) smoke | d) fly ash |
- 7) Blue baby syndrome is due to _____ pollution.
- | | |
|------------|-------------|
| a) nitrate | b) sulphate |
| c) lead | d) methane |
- 8) Relatively the stable organic end product in composting is _____
- | | |
|--------------------|----------|
| a) CO ₂ | b) water |
| c) humus | d) heat |
- 9) Magnetic separators are used to remove _____ material.
- | | |
|------------|-------------|
| a) sulphur | b) ferrous |
| c) copper | d) mercuric |
- 10) Recycling helps in energy _____
- | | |
|--------------|----------------|
| a) spending | b) saving |
| c) depletion | d) maintenance |
- 11) In plastic processing the extruder is used to produce _____
- | | |
|-----------|------------|
| a) colour | b) strands |
| c) lumps | d) pellets |
- 12) The other name for cooling is _____
- | | |
|-------------|--------------|
| a) moulding | b) screening |
| c) sorting | d) annealing |
- 13) In anaerobic processing during hydrolysis _____ are produced.
- | | |
|--------------------------------------|------------------|
| a) acetic acid | b) organic acids |
| c) CH ₄ + CO ₂ | d) monomers |

- 21) Combined production of steam and electricity is referred to as _____
- a) regeneration
 - b) cogeneration
 - c) recovery
 - d) incineration
- 22) When the digestion is completed, _____ residue remains.
- a) stabilised
 - b) non-stabilised
 - c) no
 - d) negligible
- 23) Waste reduction improves _____
- a) quality
 - b) quantity
 - c) productivity
 - d) none
- 24) Calendering and shearing are the steps in _____ processing.
- a) cardboard
 - b) glass
 - c) plastic
 - d) metal
- 25) Biogas is a source of _____
- a) renewable energy
 - b) non-renewable energy
 - c) indestructible energy
 - d) non-consumable energy
- 26) During methanogenesis the following are formed
- a) $\text{CH}_4 + \text{O}_2$
 - b) $\text{CH}_4 + \text{NO}_2$
 - c) $\text{CH}_4 + \text{CO}_2$
 - d) $\text{CH}_4 + \text{SO}_2$
- 27) Initial decomposition is carried out by _____ microorganisms.
- a) thermophilic
 - b) mesophilic
 - c) thermophobic
 - d) mesophobic
- 28) The feed rate is given by _____
- a) mass of total solid
 - b) volume of total solid
 - c) density of total solid
 - d) none of these

- 36) The lighter emission of incineration are called _____
- a) smoke
 - b) plume
 - c) bottom ash
 - d) fly ash
- 37) Organic material that can be biologically decomposed is called _____
- a) shredding
 - b) chopping
 - c) composting
 - d) annealing
- 38) The major gas in biogas is _____
- a) hydrogen sulphide
 - b) oxygen
 - c) CO₂
 - d) methane
- 39) Pulp making is the _____ step in cardboard processing.
- a) primary
 - b) secondary
 - c) tertiary
 - d) culminating
- 40) Recycling _____ the volume of the waste.
- a) reduces
 - b) increases
 - c) maintains
 - d) equalizes

SECTION – B

II. Answer **any eight** of the following :

(8×5=40)

- 1) Explain aerated static pile composting.
 - 2) Schematically explain waste-to-energy (WTE) plant.
 - 3) Discuss the steps involved in plastic processing.
 - 4) Point out the benefits of biogasification.
 - 5) Describe the components of a biogas plant.
 - 6) Discuss the steps involved in a recycling programme.
 - 7) Explain fluidised-bed incineration.
 - 8) How energy can be recovered from MSW ?
 - 9) Explain the processing equipment used for recycling.
 - 10) Describe electrostatic precipitator.
 - 11) Discuss the steps involved in hand-made paper processing.
 - 12) Write an essay on air emission and its control.
-